

84th Annual Meeting
Transportation Research Board

Can Improvements Be Made in Automobile Seat-Belt Technology?

Effectiveness of Seat Belts & Considerations for
Enhancing Occupant Protection

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Are Seat Belts Effective?

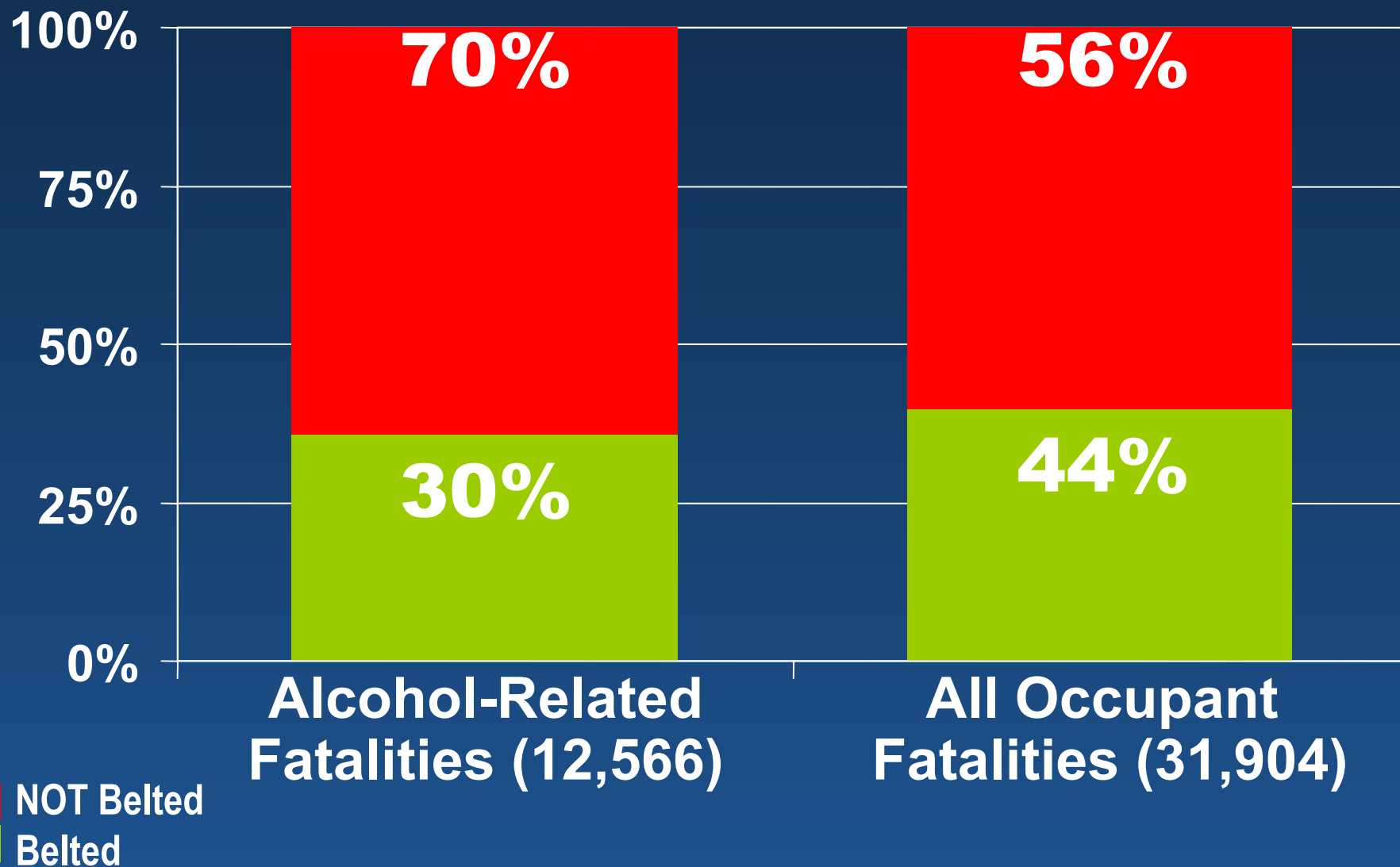
1929 CHEVROLET
WE DON'T BUILD THEM
LIKE WE USED TO

- The vehicle must do its part

- Seat belt use –
The Single most
effective strategy

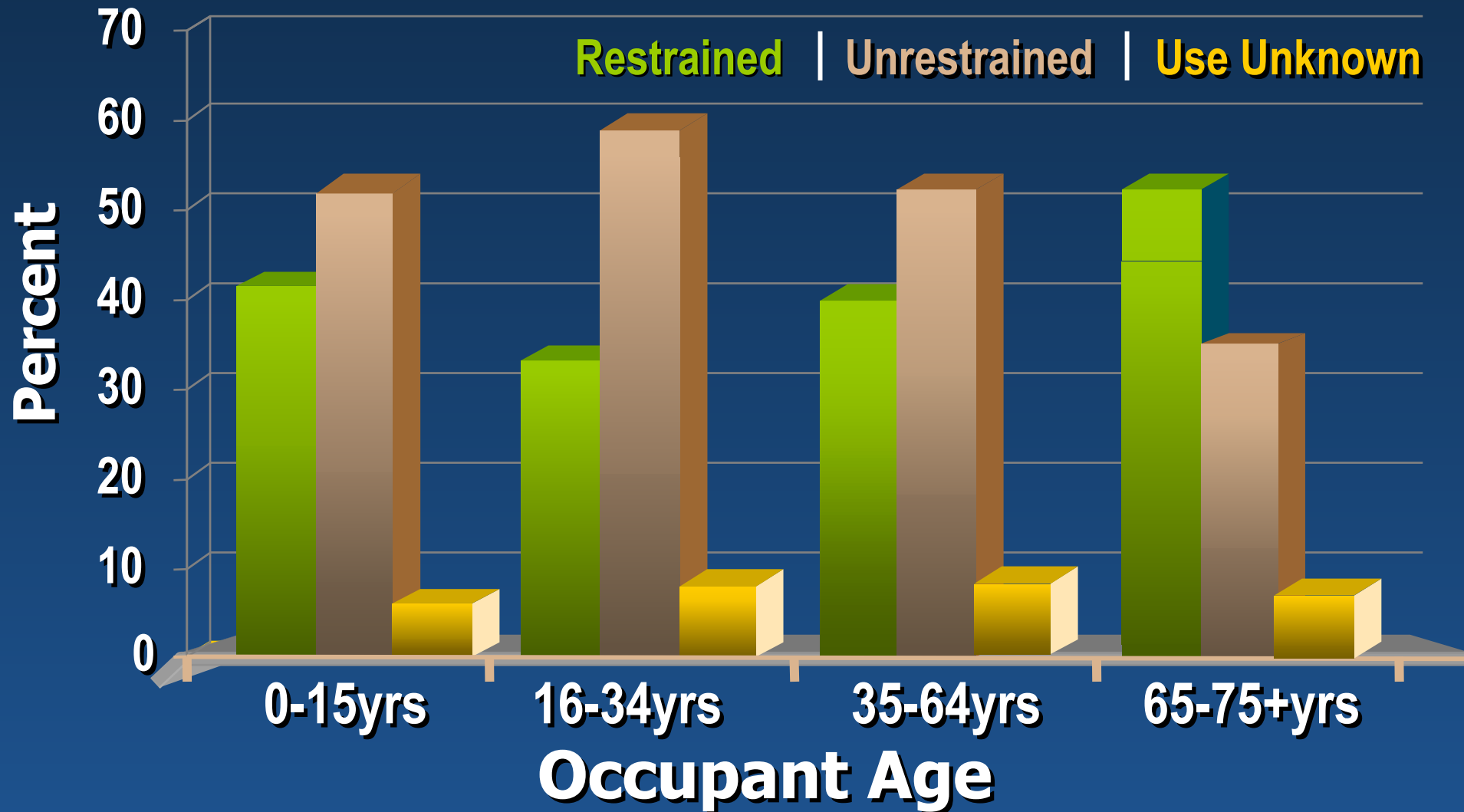


2003 Passenger Vehicle Occupant Fatalities: 31,904



Passenger Vehicle Occupants Fatalities by Age and Restraint Use-2003

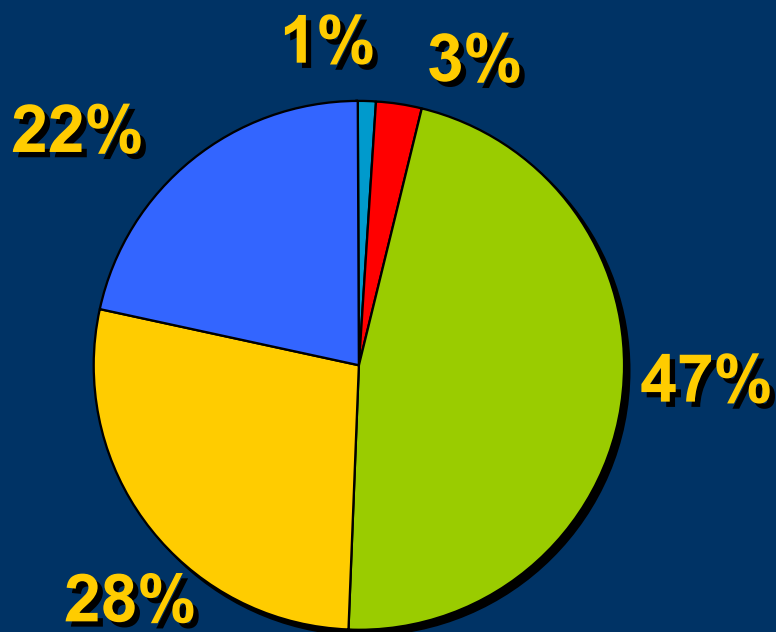
Total Fatalities \approx 32,000



Vehicles and Fatalities by Collision Type 2003

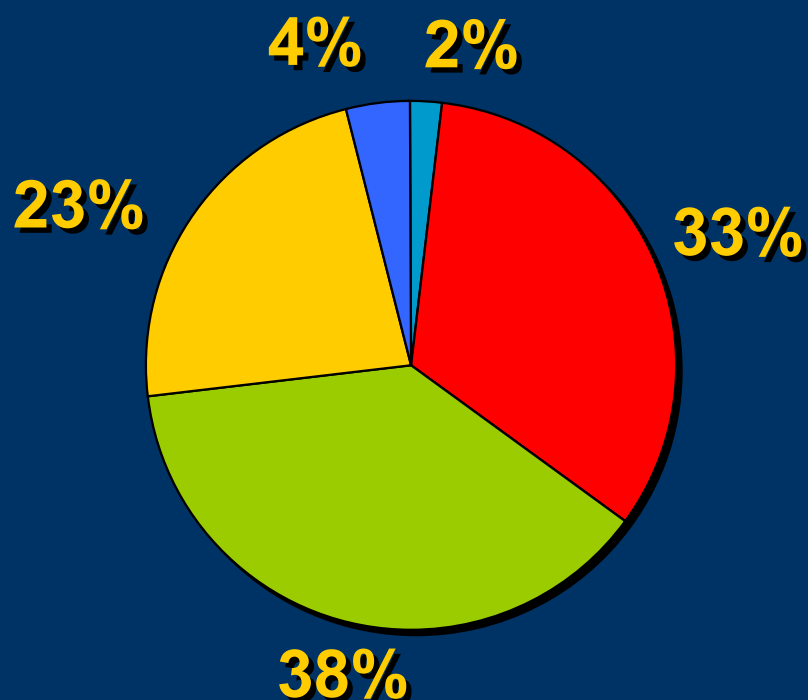
Passenger Vehicles in Crashes

Approx. 10.6 million vehicles involved



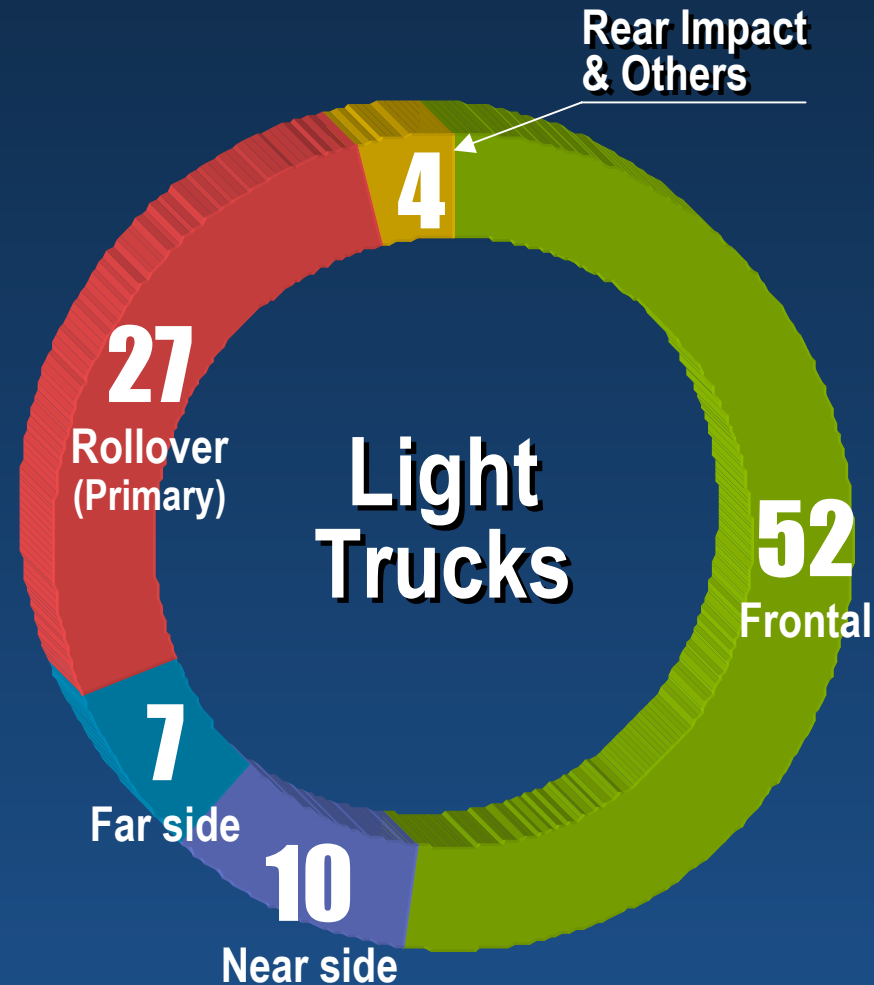
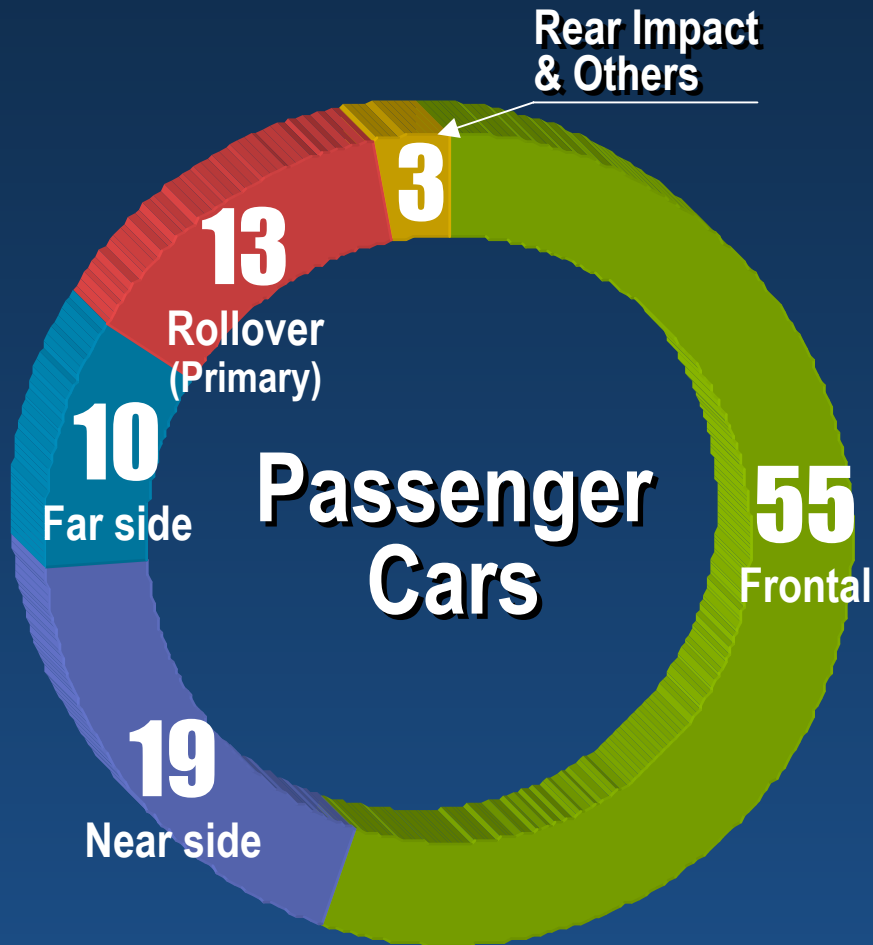
Passenger Vehicle Occupant Fatalities

31,904 total occupants killed



Rollover **Front** **Side** **Rear** **Other**

Crash Mode Distribution of Unrestrained Fatalities (Percent)



Safety Belt Use Rates 1983 – 2004 Percentage Use



Overall Effectiveness Safety Belts

	Fatality Reduction (%)
Passenger cars, 3 point belts	45
Passenger cars, 2 point belts	32
Light Trucks, 3 point belts	60

Fatality Reduction By Direction of Impact

	Car 3 Pt. Belts	Light Trucks 3 Pt. Belts
Frontal Impact	50	53
Side Impact	21	48
Near Side	10	41
Far Side	39	58
Rollover (Primary)	74	80
Rear Impacts & Others	56	81

Fatality Reduction in Frontal Impacts By Struck Vehicle/Object

	Car 3 Pt. Belts	Light Trucks 3 Pt. Belts
Frontal Impacts		
Fixed Object	60	64
Multi-Vehicle	42	40
With Car	48	51
With LTV	39	42

Fatality Reduction in Side Impacts By Struck Vehicle/Object

	Car 3 Pt. Belts	Light Trucks 3 Pt. Belts
Near Side Impacts		
Fixed Object	21	47
Multi-Vehicle	5	36
By Car	12	69
By LTV	2	31
Far- Side Impacts		
Fixed Object	46	61
Multi-Vehicle	35	54
By Car	45	71
By LTV	36	50

Source: NHTSA Technical Report DOT HS 809 198, December 2000

Crash Time Line

Prevention



Protection



0

100 m.sec.

1 hr



**Severity
Reduction**



**Post
Crash**

The Effectiveness of Safety Belt Reminder Systems Study

- **Problem**
 - Safety belt use in the US remains low
 - Advanced belt reminder systems are becoming common
- **Objectives**
 - Effectiveness assessment - acceptance of belt reminder systems
 - Identify potential enhancements

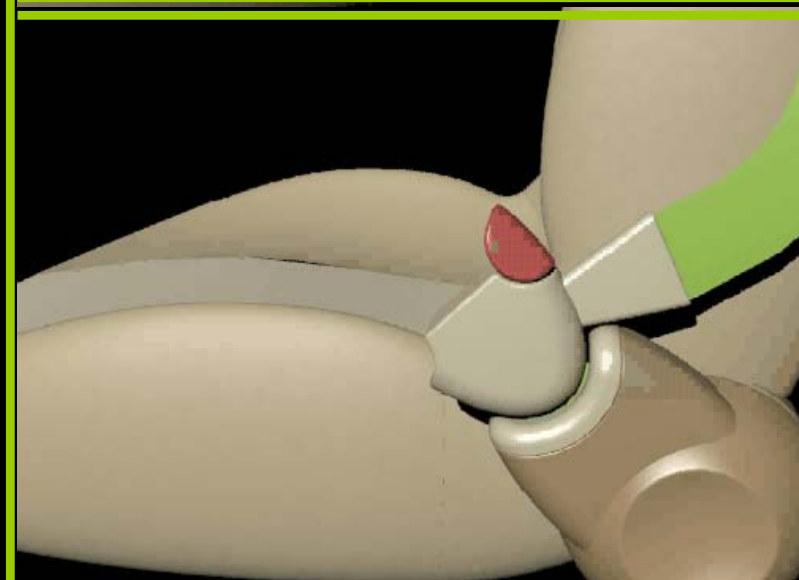
The Effectiveness of Safety Belt Reminder Systems Study

- **Approach**
 - Field study observing belt use conduct – survey of user acceptance and effectiveness
 - Experiment to investigate enhancements
 - **Assess feasibility of after-market systems**
 - **Assess role of belt comfort and convenience on acceptance of belt reminders**

Advanced Car Seating and Belt Systems Project

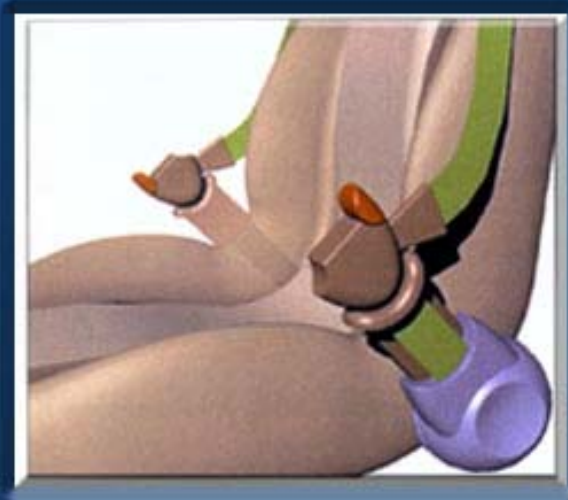
- To improve convenience, effectiveness and use
- To evaluate ergonomically and structurally alternative designs
- Emphasis is on integrated systems

Advanced Car seating Restraint Systems

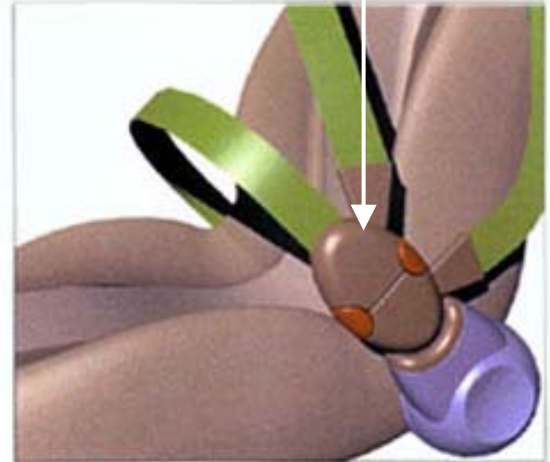
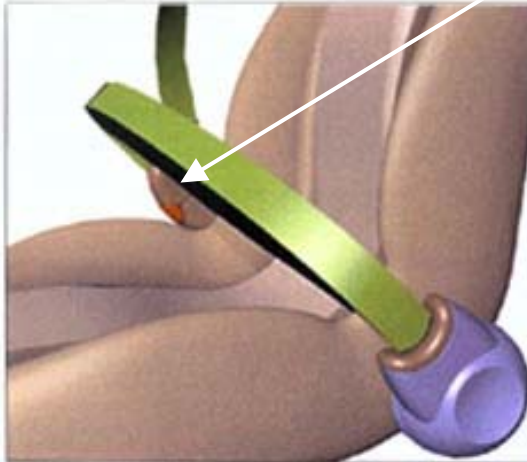


Advanced Car seating Restraint Systems

Lower buckle pusher
with adjustable
back/head support
mounted upper d-ring



Variable 3-point right
or left or 4-point
harness



Design Considerations

- Integration into seat
- Occupant's familiarity with conventional systems
- Adjustability to accommodate various occupant sizes / shapes
- Gentle reminders rather than perception of punishment
- Ease of access, ingress and egress
- Effective in full range of crash modes

Conclusion

- **Single most effective safety countermeasure**
- **Need to achieve higher usage rate**
- **Technologies could improve usage rate and effectiveness**
- **Make belts more convenient and comfortable to use**